Length of Weaning Period But Not Timing of Vaccination Affects Feedlot Receiving Performance and Health of Fall-Weaned, Ranch-Direct Beef Calves

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Introduction

Weaning and preconditioning programs are thought to be crucial to calf health and performance during the finishing period. The stress of maternal separation, changes in diet, environmental changes, and exposure to unfamiliar pathogens increase susceptibility of recently weaned calves to bovine respiratory disease. Vaccination programs are implemented near weaning to decrease the incidence of respiratory disease.

Many vaccination strategies are practiced by cow-calf producers in the United States. The most cautious strategy involves vaccination against respiratory disease pathogens 2 to 4 weeks before maternal separation followed by a booster at weaning. This strategy is used in instances in which time, labor, and facilities are available to gather and process calves while they are still suckling. Another common strategy is to defer vaccination until after calves have been shipped to a feedlot. Deferring vaccination until arrival in feedlots is thought to increase incidence of respiratory disease compared with vaccination programs implemented at the ranch of origin. This assumption has not been widely scrutinized for native Kansas cattle that are finished in Kansas feedlots.

Previous research has demonstrated that length of the weaning period at the ranch of origin can influence growth and health of beef calves during the receiving period at a feedlot. Therefore, it is reasonable to expect that vaccination strategy and length of the weaning period may have synergistic effects on calf performance during the receiving phase. The objective of this experiment was to compare the effects of vaccination against respiratory diseases before weaning on the ranch of origin and after arrival at a feedlot for calves weaned 45, 15, or 0 days before feedlot arrival.

Experimental Procedures

Angus × Hereford calves (n = 437; average initial weight = 458 ± 54 lb) were used for this experiment. Calves originated from the Kansas State University commercial cow-calf herds in Manhattan (n = 263) and Hays (n = 174). At the time of maternal separation, calves were 175 to 220 days of age. All calves were dehorned and castrated (if needed) before 60 days of age.

Approximately 60 days before maternal separation, calves were stratified by body weight, sex, and birth date and assigned randomly to a preshipment weaning period (i.e., 45, 15, or 0 days before shipment). Within each weaning period treatment, calves were assigned randomly to one of two vaccination treatments. One group was vaccinated 14 days before maternal separation and again at weaning. The second group

was vaccinated on the day of arrival at the feedlot and again 14 days later. Initial and booster vaccinations against common respiratory pathogens were administered using a modified-live product (Bovi-Shield Gold FP; Pfizer Animal Health, New York, NY). Calves were treated for internal and external parasites using Dectomax (Pfizer Animal Health Exton, PA) and vaccinated against clostridial diseases (Vision 7 with SPUR; Intervet Inc., Millsboro, DE) at the time of maternal separation. Calves were then transported a short distance (<15 miles) to a central weaning facility.

Calves were weaned in dirt-surfaced pens (four pens per treatment) and fed a common weaning diet (Table 1). The weaning diet was formulated to achieve an ADG of 2.0 lb at a dry matter intake of 2.5% of body weight.

Calves were monitored for symptoms of respiratory disease at 7:00 a.m. and 2:00 p.m. daily during the ranch-of-origin weaning period. Calves with clinical signs of respiratory disease (Table 2), as judged by animal caretakers, were removed from home pens and evaluated. Each calf with clinical signs of respiratory disease was weighed, had its rectal temperature measured, and was assigned a clinical illness score (Table 2). Calves that presented with a clinical illness score greater than 1 and a rectal temperature greater than 104°F were treated according to the schedule described in Table 3. Cattle were evaluated 72 hours posttreatment and re-treated as appropriate on the basis of observed clinical signs.

All calves were individually weighed and transported 4 hours from their respective weaning facilities to an auction market located in Hays, KS, on Nov. 5, 2008. Calves from both origins were commingled with respect to gender and treatment and were maintained on the premises of the auction market for 12 hours. This commingling simulated the pathogen exposure typically encountered by market-ready calves. On November 6, calves were shipped 5 miles to the feedlot located at the Agricultural Research Center–Hays. Upon arrival at the feedlot, calves were weighed individually and assigned to a receiving pen on the basis of their weaning and vaccination treatments.

The cattle were adapted to a receiving ration (Table 4), and daily dry matter intake was recorded throughout a 60-day receiving period. Calves were monitored for symptoms of respiratory disease daily at 7:00 a.m. and 2:00 p.m. Clinical symptoms of disease were evaluated and treated as during the weaning phase. Calf body weights were measured again 60 days after arrival at the feedlot.

Results and Discussion

Average daily gain was greater ($P<0.01$) for calves weaned 45 days before shipping to the feedlot than for calves weaned either 15 or 0 days before shipping to the feedlot (Figure 1). This occurred because calves weaned for 45 days before shipping consumed, on average, a more energy-dense diet than calves that suckled their dams for all or part of this period.

Incidence of undifferentiated fever during the 15-day period following maternal separation was greater ($P<0.01$) for calves on the 45-day weaning treatment than for those on the 15-day weaning treatment. Reasons for this response were unclear. Calf average

daily gain and incidence of undifferentiated fever during the preshipping period were similar (P=0.66) between calves vaccinated at the ranch of origin and those that were not vaccinated until they arrived at the feedlot. Evidently, the pathogen challenge and the stress associated with maternal separation were insufficient to increase incidence of respiratory disease among unvaccinated calves during the ranch-of-origin weaning period.

Calf average daily gain during the 60-day feedlot receiving period was similar (P=0.62) between calves weaned for 45 or 15 days before feedlot placement; however, both groups of weaned calves tended to have greater (P<0.07) average daily gain during that period than calves shipped directly to the feedlot after maternal separation (i.e., the 0-day weaning treatment; Figure 2). In contrast, length of the ranch-of-origin weaning period did not affect (P=0.73) incidence of undifferentiated fever during the receiving period.

Timing of vaccination did not affect calf average daily gain during the 60-day feedlot receiving period and was similar for calves vaccinated on their ranch of origin and calves not vaccinated until feedlot arrival (Figure 3).

As during the preshipment weaning period, incidence of undifferentiated fever during the receiving period was similar (P=0.80) between calves vaccinated against respiratory disease-causing organisms on the ranch of origin and those that were not vaccinated until they arrived at the feedlot. Only 4 of 437 calves were treated for presumptive respiratory disease during this period. This result was surprising and seemed to indicate that labor and time savings might be realized by deferring vaccination until after feedlot arrival without sacrificing animal performance; however, caution is urged in extrapolating these results to other situations. The calves in our study had excellent overall health during the receiving period. In addition, these ranch-direct calves probably had less pathogen exposure than is typical for market-sourced cattle.

Feed intake (dry matter basis) during the receiving period increased (P<0.03) successively with length of the ranch-of-origin weaning period (Figure 4). More experience consuming dry diets from a feedbunk before shipping translated to greater feed intake and greater average daily gain during the receiving period. Feed efficiency during receiving was not influenced (P = 0.30) by length of the ranch-of-origin feeding period. Furthermore, the timing of vaccination did not affect (P>0.28) feed intake or feed efficiency during the receiving period (Figure 5).

Implications

This study is in agreement with previous Kansas State University research, which reported that ranch-of-origin weaning periods longer than 15 days do not improve health or performance at the feedlot for cattle that are moved quickly from their ranch of origin to a feedlot and not commingled with market-sourced cattle. This study also raises the possibility that preshipment vaccination may not improve health or performance of ranch-direct cattle relative to vaccination that is deferred until feedlot arrival. Further research will be necessary to verify this finding.

Table 1. Ingredient and nutritional composition of the weaning diet

Ingredient[1]	%, dry matter basis
Extender pellets (alfalfa)	41.82
Corn gluten feed	18.22
Wheat midds	14.68
Cracked corn	10.78
Cottonseed hulls	7.68
Dried distillers grain	3.01
Molasses	1.67
Limestone	1.85
Nutrient composition	
Crude protein	15.31
Calcium	0.56
Phosphorus	0.43
NE_m, Mcal/lb	0.65
NE_g, Mcal/lb	0.39

[1] Diet also included salt, zinc sulfate, and Rumensin 80.

Table 2. Scoring system used to classify the severity of clinical illness

Clinical illness score	Description	Clinical appearance
1	Normal	No abnormalities noted
2	Slightly ill	Mild depression, gaunt, +/- cough
3	Moderate illness	Severe depression, labored breathing, ocular/nasal discharge, +/- cough
4	Severe illness	Moribund, near death, little response to human approach

Table 3. Treatment schedule used to treat calves diagnosed with bovine respiratory disease complex

Treatment	Drug	Dose	Route of injection
1st Pull	Baytril (enrofloxacin)	5 mL/cwt	Subcutaneous
2nd Pull	Nuflor (florfenicol)	6 mL/cwt	Subcutaneous
3rd Pull	Biomycin (oxytetracycline)	5 mL/cwt	Subcutaneous

Table 4. Average ingredient and nutritional composition of the receiving diet

Ingredient[1]	%, dry matter basis
Rolled milo	59.43
Sorghum silage	25.47
Soybean meal	11.04
Limestone	2.08
Ammonium sulfate	0.44
Urea	0.06
Salt	0.06
Nutrient composition	
Crude protein, %	15.90
Calcium, %	1.01
Phosphorus, %	0.33
NE_m, Mcal/lb	0.79
NE_g, Mcal/lb	0.51

[1] Diet also included salt, Rumensin 80, Tylan 40, and trace minerals.

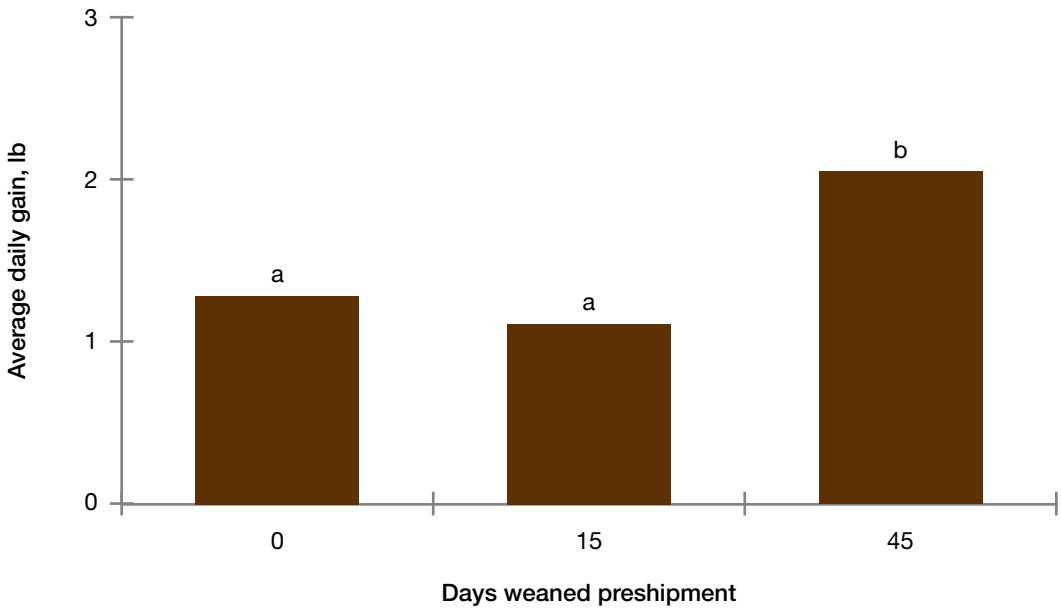

Figure 1. Effect of length of the weaning period at the ranch of origin on average daily gain of calves before feedlot arrival.

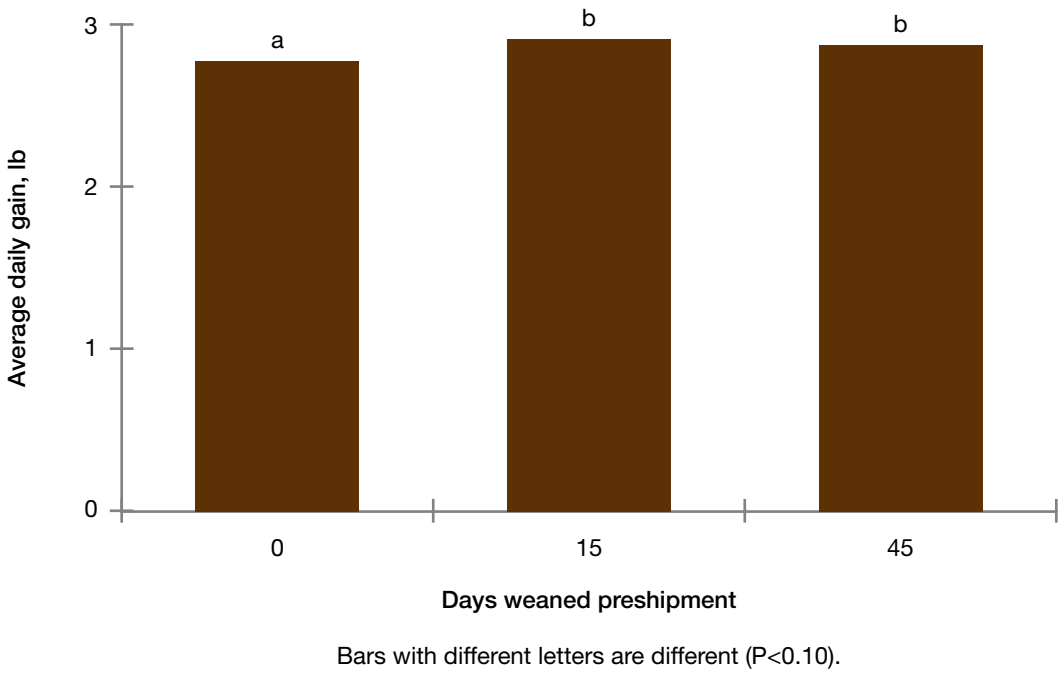

Figure 2. Effect of length of weaning period at the ranch of origin on average daily gain of calves during a 60-day feedlot receiving period.

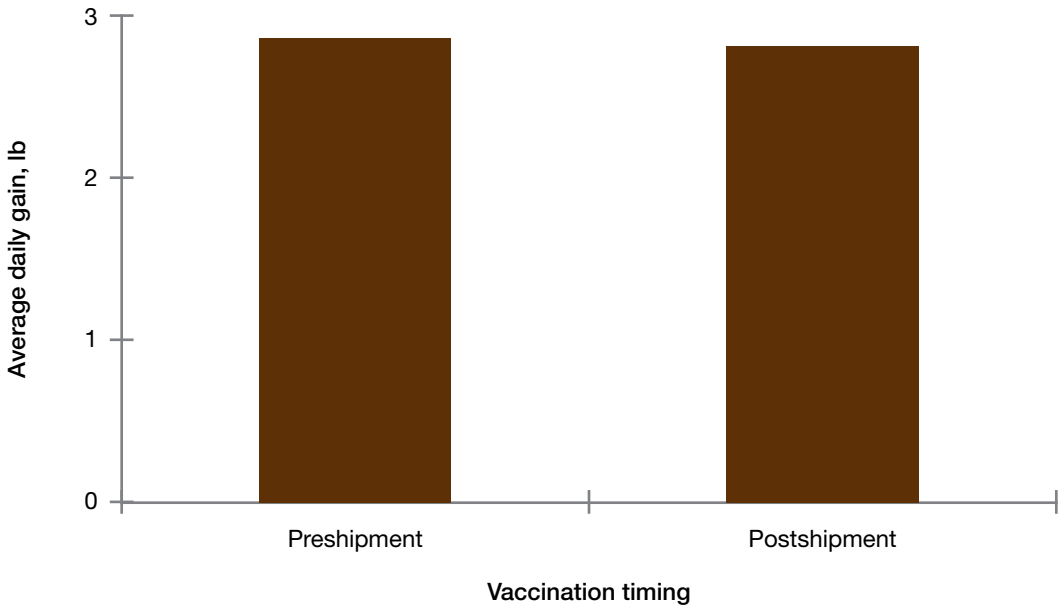

Figure 3. Effect of timing of vaccination on average daily gain of calves during a 60-day feedlot receiving period.

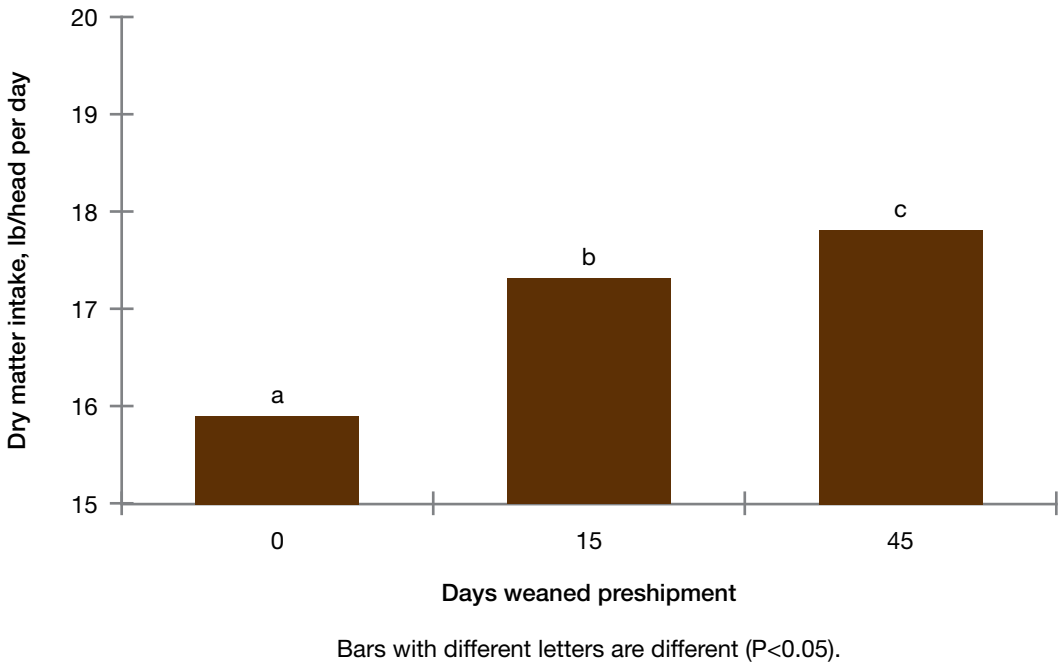

Figure 4. Effect of length of the ranch-of-origin weaning on dry matter intake by calves during a 60-day feedlot receiving period.

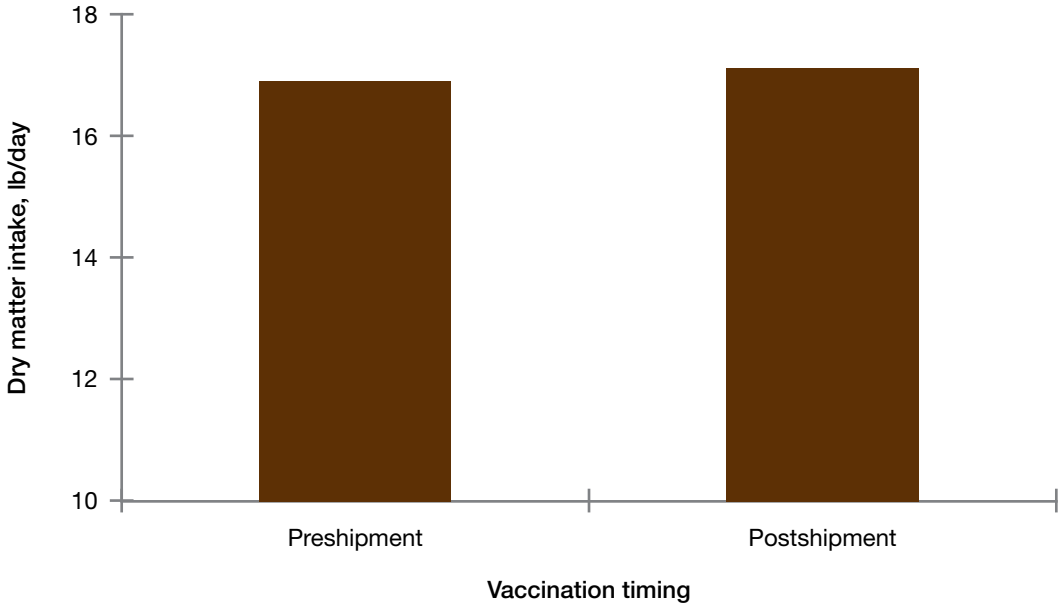

Figure 5. Effect of timing of vaccination on dry matter intake by calves during a 60-day feedlot receiving period.